

Sturtevant's Law in Hittite: A Reassessment

Allan R. BOMHARD
Charleston, South Carolina, USA

1. Introduction

“Sturtevant’s Law” is the name given to the Hittite scribal convention according to which double writing of medial stops (though only when the cuneiform syllabary makes this possible, and even then not consistently [cf. Melchert 1994: 14]) in certain words contrasts with single writing of medial stops in certain other words. This writing convention is interpreted under Sturtevant’s Law to be the method by which the Hittite scribes indicated some sort of phonemic contrast, usually taken to be a contrast between medial voiceless stops on the one hand and medial voiced stops on the other (cf. Sturtevant 1951: 26-28, §53). This interpretation is based upon the observation that words exhibiting medial double writing of stops generally correspond etymologically to words in other Indo-European languages with medial voiceless stops (or their equivalents), while words exhibiting medial single writing of stops generally correspond etymologically to words in other Indo-European languages with medial voiced stops (or their equivalents), the latter being derived from what has traditionally been reconstructed as either plain voiced stops or as voiced aspirated stops at the Proto-Indo-European level. The following examples illustrate the general patterning (the Proto-Indo-European reconstructions are given in traditional transcription):

Medial Double Writing:

- A. Hittite (3 pl. pres.) *li-ip-pa-an-zi* “they smear” (also written *li-pa-a-an-zi*) = Sanskrit *liptá-h* “smeared, anointed”; Greek λιπαρός “oily, greasy”, λίπος “fat, oil” < Proto-Indo-European **lip-*.
- B. Hittite *a-ap-pa* “afterwards, back, again” = Sanskrit *ápa* “away, from, off”; Greek ἄπο, ἀπό “from, away from, far from, apart from, away, off, back again” < Proto-Indo-European **ǵ₄epo-*.
- C. Hittite (3 sg. mid.) *ki-it-ta(-ri)* “lies” = Sanskrit (3 sg. mid. impf.) *á-śeta* “lay”, (3 sg. mid. pres.) *śéte* “lies”; Avestan *saēte* “lies”; Greek (3 sg. impf.) ἔ-κειτο “lay”, (3 sg. pres.) κείται “lies” < Proto-Indo-European 3 sg. mid. ending *-*to-*.
- D. Hittite (acc. sg.) *ú-it-ta-an* “year” = Greek ἔτος “year”; Latin *vetus* “old” < Proto-Indo-European **ǵet-*.

- E. Hittite (3 sg. pres.) *lu-uk-ki-iz-zi* “kindles, grows light” (also *lu-uk-zi*) = Greek λευκός “light, bright, brilliant, white”; Latin *lūceō* “to shine” < Proto-Indo-European **leuq-*.

Medial Single Writing:

- A. Hittite (nom.-acc. sg.) *ne-pí-iš* “heaven, sky” = Sanskrit *nábhas-* “sky, cloud, mist”; Greek νέφος “cloud”; Old Church Slavic *nebo* “sky” < Proto-Indo-European **nebhos-*.
- B. Hittite (nom.-acc. sg.) *pí-e-da-an* “place” = Sanskrit *padám* “step, footstep, position, site”; Greek πέδον “the ground, earth” < Proto-Indo-European **pedom-*.
- C. Hittite (nom.-acc. sg.) *wa-a-tar* “water” = Sanskrit *udán-* “water”; Greek ὕδωρ “water”; Gothic *watō* “water”; Old Church Slavic *voda* “water” < Proto-Indo-European **ued-/uod-/*ud-*.
- D. Hittite (1 sg. pres.) *e-it-mi* “I eat” = Sanskrit *ádmi* “I eat”; Greek ἔδομαι “I eat”; Latin *edō* “I eat” < Proto-Indo-European **ǵ₁ed-*.
- E. Hittite (nom.-acc. sg.) *i-ú-kán, i-ú-ga-an* “yoke” = Sanskrit *yugám* “yoke”; Greek ζυγόν “yoke”; Latin *iugum* “yoke”; Gothic *juk* “yoke”; Old Church Slavic *igo* (< **jǵgo*) “yoke” < Proto-Indo-European **iugom-*.
- F. Hittite (nom. sg.) *har-ki-iš* “white” = Sanskrit *árjuna-h* “white, bright”; Greek ἀργός “shining, bright, glistening”; Latin *argentum* “silver” < Proto-Indo-European **ǵ₂erǵ-*.
- G. Hittite (nom. sg.) *pár-ku-uš* “high” = Armenian *barjr* “high”; Sanskrit *bṛhánt-* “high” < Proto-Indo-European **bhrǵh-*.
- H. Hittite (nom.-acc. sg.) *hé-kur, hé-gur* “summit, peak” = Sanskrit *ágram* “point, tip, summit” < Proto-Indo-European **ǵ₃eg^{ur}-*.

There also exist several well-known exceptions to Sturtevant's Law, in which words exhibiting medial double writing of stops in Hittite correspond etymologically to words in other Indo-European languages with medial voiced stops. Examples include (cf. Kronasser 1966: 14; Bomhard 1984: 116):

- A. Hittite *ú-uk-ga* “I” (also written *ú-uk, ú-ga*; the *u* is probably analogical after the 2 sg. personal pronoun *tu-uk, tu-ga* “you” [cf. Melchert 1994: 7]) = Latin *egō, egō* “I”; Greek ἐγώ(ν) “I” < Proto-Indo-European **ǵ₁eg^h-oǵ*.
- B. Hittite 2 pl. medio-passive primary ending *-dduma* in, for example, *i-ya-at-du-ma* “you go” = Sanskrit 2 pl. mid. secondary ending *-dhvam*; Avestan 2 pl. mid. secondary ending *-δwəm*; Greek 2 dual mid. primary and secondary ending *-σθον* (< **-zdhuom*) < Proto-Indo-European **-dhuem/*-dhuom/*-dhum-*.

- C. Hittite (3 sg. pres.) *píd-da-i*, *pád-da-i* “to dig” = Latin *fodiō* “to dig”; Lithuanian *bedù*, *bèsti* “to dig, to bury”; Gaulish *bedo-* “canal, ditch”; Old Church Slavic *bodq*, *bosti* “to stick, to prick” < Proto-Indo-European **bhedh-/bhodh-*.
- D. Hittite (acc.-dat. sg.) *am-mu-uk-ga* “to me” (also written *am-mu-uk*, *am-mu-ug-ga*, *am-mu-uq-qa*, *am-mu-uk-qa*) = Greek (acc. sg.) ἔμε-γε “me” < Proto-Indo-European **-ge*.
- E. Hittite (nom. sg.) *me-ik-ki-iš* “large” = Greek μέγας “great” < Proto-Indo-European **megh-*.

It is these exceptions that previously led me to question the validity of Sturtevant’s Law (cf. Bomhard 1984: 116-119).

2. The Reconstruction of the Proto-Indo-European Stop System

At the beginning of this century, the Neogrammarian reconstruction of the Proto-Indo-European phonological system, which was based upon the principle that sound laws admit no exceptions, was widely accepted as being a fairly accurate representation of what had existed in the Indo-European parent language. To this day, the Neogrammarian reconstruction (or variations of that reconstruction) enjoys widespread support among Indo-Europeanists. The Neogrammarian reconstruction of the Proto-Indo-European stop system, which was modeled after the phonological system found in Old Indo-Aryan (represented by Vedic and Classical Sanskrit) consisted of a four-way contrast of (1) plain voiceless stops, (2) voiceless aspirated stops, (3) plain voiced stops, and (4) voiced aspirated stops, thus (cf. Brugmann 1904: 52; see also Szemerényi 1996: 54-69):

| 1 | 2 | 3 | 4 | |
|----|-----|----|-----|--------------|
| p | ph | b | bh | (labial) |
| t | th | d | dh | (dental) |
| ḱ | ḱh | ǵ | ǵh | (palatal) |
| q | qh | g | gh | (pure velar) |
| qʷ | qʷh | gʷ | gʷh | (labiovelar) |

During this century, it became widely accepted that the traditional voiceless aspirates (column 2) should be removed from the Proto-Indo-European phonological inventory (cf. Bomhard 1986: 69-71 for details). The problem with removing the voiceless aspirates, however, is that the resulting

system has no typological parallels among the known languages of the world (cf. Jakobson 1971 [1957]: 528; Martinet 1970: 115). And yet, on structural grounds, positing a three-way contrast (without the voiceless aspirates) for Proto-Indo-European instead of the four-way contrast (with the voiceless aspirates) posited by the Neogrammarians seems fully justified.

There are also problems involving the traditional plain voiced stops (column 3). One such problem, which is usually mentioned in the standard handbooks, is the unexpected statistically low frequency of occurrence of the traditional plain voiced bilabial stop **b*. As a matter of fact, the entire series of plain voiced stops is characterized by a statistically low frequency of occurrence in comparison with the traditional plain voiceless stops and the traditional voiced aspirates. Moreover, the traditional plain voiced stops are rarely found in pronouns and in inflectional affixes. Finally, there is the problem of the root structure constraint that prohibits the co-occurrence of two plain voiced stops in a given root.

It was in trying to find solutions to these problems in particular that the Georgian scholar Thomas V. Gamkrelidze and the Russian scholar Vjačeslav V. Ivanov, on the one hand, and the British-born American scholar Paul J. Hopper, on the other, working independently, were led to propose, in the early 1970's, a radical revision of the Proto-Indo-European stop system. Observing that the traditional plain voiced stops seemed to exhibit many of the typological characteristics of glottalized stops (ejectives), they proposed reinterpreting this series as ejectives. In their version of what has now come to be known as the "Glottalic Theory", Gamkrelidze and Ivanov made no changes to the traditional voiced aspirates, but they reinterpreted the traditional plain voiceless stops as voiceless aspirates. In this revised interpretation, aspiration is viewed as a redundant feature, and the phonemes in question could be realized as allophonic variants with or without aspiration depending upon the paradigmatic alternation of root phonemes. The system of Gamkrelidze and Ivanov may be represented as follows (cf. Gamkrelidze 1976: 403):

| 1 | 2 | 3 | 4 | |
|-------------------|---|-----------------|-------------------|--------------|
| p ^[h] | - | (p') | b ^[h] | (labial) |
| t ^[h] | - | t' | d ^[h] | (dental) |
| ḱ ^[h] | - | ḱ' | ǵ ^[h] | (palatal) |
| k ^[h] | - | k' | g ^[h] | (pure velar) |
| k ^{w[h]} | - | k' ^w | g ^{w[h]} | (labiovelar) |

The revisions proposed by Gamkrelidze, Hopper, and Ivanov provide typologically natural explanations for the problems mentioned above, specifically:

- A. By reinterpreting the traditional plain voiceless stops (column 1) as voiceless aspirates, there is no longer a problem, from a typological point of view, with positing a series of voiced aspirates (column 4) for Proto-Indo-European, since the imbalance caused by the removal of the traditional voiceless aspirates (column 2) is eliminated.
- B. Reinterpretation of the traditional plain voiced stops (column 3) as glottalics makes it easy to account for the statistically low frequency of occurrence of the traditional plain voiced bilabial stop (which becomes a bilabial ejective in the revised system), since the bilabial member is always characterized by a low frequency of occurrence (there often being a total absence at this point of articulation) in attested languages having ejectives.
- C. In languages having ejectives, it is common for ejectives to be either excluded from or underrepresented in inflectional affixes and pronouns.
- D. Several languages with ejectives have a constraint against the co-occurrence of two ejectives in a root. Thus, reinterpretation of the traditional plain voiced stops as glottalics provides a typologically natural explanation for the root structure constraint prohibiting the co-occurrence of two (traditional) plain voiced stops in a given root.

Moreover, the revisions proposed by Gamkrelidze, Hopper, and Ivanov provide new insights into the underlying principles governing Grassmann's Law and Barthomomae's Law. Finally, it may be noted that strong support for the changes proposed by Gamkrelidze, Hopper, and Ivanov is to be found in Germanic, Armenian, and (the poorly-attested) Phrygian (cf. Diakonoff — Neroznak 1985: 5). According to the traditional interpretation, Germanic, Armenian, and Phrygian had been thought to have undergone "sound shifts" (*Lautverschiebungen*). Under the revised interpretation, however, they are rightly seen as relic areas.

The Proto-Indo-European stop system reconstructed above may be viewed as reflecting a late stage of development. For pre-Anatolian Proto-Indo-European, I have argued elsewhere that the traditional voiced aspirates are to be reconstructed as plain voiced stops and that the development of this series into voiced aspirates is a later development (cf. Bomhard 1984: 31-34; 1996: 50 and 54). That this series was not aspirated in pre-Anatolian Proto-Indo-European will be demonstrated below.

3. From Proto-Indo-European to Proto-Anatolian

The three series reconstructed for Proto-Indo-European in the preceding section were preserved as separate series in Proto-Anatolian. This is clear, for instance, from the different treatment of the voiced and non-voiced velar stops before high front vowels in the Luwian branch of Anatolian (Hieroglyphic and Cuneiform Luwian along with the later Lycian). Here, the non-voiced members are preserved, while the voiced member is lost; for example (the Proto-Indo-European reconstructions will now be transcribed according to the system of Gamkrelidze and Ivanov):

- A. Cuneiform Luwian *kiša-* “to comb, to card” = Hittite *kišai-* “to comb” < Proto-Anatolian **k^{hes}-* “to comb, to card” < pre-Anatolian Proto-Indo-European **k^[h]es-*. Probable non-Anatolian cognates include Greek κέσκεον (< **kes-kes-*) “tow, oakum”; Old Church Slavic *češq*, *česati* “to comb, to pull off”.
- B. Cuneiform Luwian (nom. sg.) *(i-)iš-ša-ri-iš* “hand”; Hieroglyphic Luwian (dat. sg.) *istri* “hand”; Lycian *izri-* “hand” (all with loss of an earlier initial voiced velar before high front vowel) = Hittite (nom.-acc. sg.) *ki-eš-šar* “hand” < Proto-Anatolian **gēsar* “hand” < pre-Anatolian Proto-Indo-European **gēs_ṛ*. Non-Anatolian cognates (from the same root but with a different suffix) include the following: Sanskrit *hásta-h* “hand”; Old Persian *dasta-* “hand”; Avestan *zasta-* “hand”; Latin *praestō* (< **praehestōd*) “at hand, ready”. The Hieroglyphic Luwian form contains an epenthetic *t*.

More evidence is possibly to be found in the treatment of dentals initially before high front vowels in Hittite. In this case, the voiceless aspirated and plain voiced members are preserved, while the plain voiceless (from earlier glottalized) member becomes *š*, as shown in the following example:

- A. Hittite (dat.-loc. sg.) *šiwatti* “day” and (gen. sg.) *ši-(i-)ú-na-aš* “god” = Palaic (nom. sg.) *Ti-ya-az(-)* name of the sun-god; Hieroglyphic Luwian *Tiwat-*, (adj.) *tiwatami-* “bright, sunny” < Proto-Anatolian **tyēwat-* < pre-Anatolian Proto-Indo-European **t’yēw-*. Non-Anatolian cognates include Sanskrit *dyáu-h* “heaven, sky, day”, *devá-h* “god”; Greek Ζεύς “Zeus”, δῖος “god-like, divine”; Armenian *tiv* “day”; Latin *diēs* “day”, *deus* “god”; Old Irish *díe*, *día* “day”.

There may be additional evidence from the later Lycian and Lydian, as Shevoroshkin (1988) has tried to show. Shevoroshkin claims, for instance, that the Proto-Indo-European stop system has developed as follows in Lycian:

| Indo-European | Milyan Initially | Milyan Medially | Lycian Initially | Lycian Medially |
|---------------|------------------|-----------------|------------------|-----------------|
| t | t- | -t- | t- | -t- |
| d | d- | -d- | dd- | -d- |
| dh | t- | -d- | t- | -d- |

Some of the evidence that Shevoroshkin adduces to support his views, however, is questionable and is to be treated with the utmost caution. Moreover, there is other Lycian evidence, not cited by Shevoroshkin, that points to alternative interpretations (note also Melchert's [1994: 53-54] critical assessment of Shevoroshkin's views).

There are enough clues within the Anatolian daughter languages to support the contention that the three series of stops reconstructed for the phonological system of the Indo-European parent language maintained their separate identity in Proto-Anatolian. It is not possible to tell, however, whether or not series 3 was glottalized at the Proto-Anatolian level, though there is nothing to indicate that it was. I assume that series 3 was not glottalized in Proto-Anatolian. The most important point to bear in mind is that it is series 3 and 4 that are represented by medial single writing in Hittite and that it is series 1 that is represented by medial double writing. Thus, the Proto-Anatolian stop system is probably to be reconstructed as follows:

| 1 | 2 | 3 | 4 |
|--------------------|---|------|------|
| p ^h | - | p | b |
| t ^h | - | t | d |
| ḱ ^h | - | ḱ | ḡ |
| k ^h | - | k | g |
| k ^{hw} /u | - | kw/u | gw/u |

Note: Melchert (1994: 53) assumes that series 3 and 4 merged in Proto-Anatolian. Moreover, he assumes (1994: 21) that the earlier voicing contrast was replaced by a fortis ~ lenis opposition in the older Anatolian daughter languages.

4. Hittite

Hittite was written in a cuneiform syllabary derived from a form of Old Akkadian cuneiform in use in Northern Syria in the beginning of the second millennium B.C.E. (cf. Gamkrelidze 1968: 91-92). Now, the older cuneiform writing system was not suited to rendering Akkadian, much less Hittite. In Old Akkadian, voiceless, voiced, and emphatic consonants were not differentiated in the writing system, though methods were gradually developed to represent most of the Akkadian phonological distinctions. This is important, for no attempt was ever made, even after Akkadian had introduced separate syllabograms to differentiate voiceless, voiced, and emphatic consonants, to modify the Hittite writing practices to make use of the same methods to note a voicing contrast in stops. We must conclude, therefore, that the Hittite scribes did not feel that it was worthwhile to note such a contrast, regardless of what the underlying phonetics may have been.

What then, if anything, does medial double writing of stops indicate if not a voicing contrast? The answer to this question can be ascertained by looking closely at the Proto-Anatolian stop system reconstructed above. Series 1 is differentiated from series 3 by the presence of aspiration and from series 4 by the absence of voicing, while series 3 and 4 are differentiated from each other by a contrast in voicing. Since it is only series 1 that is represented by medial double writing, it must have been the feature of aspiration that was considered significant by the Hittite scribes. This means that series 4 cannot have been aspirated since it too would have been represented by medial double writing. It also means that the opposition of medial double writing and medial single writing cannot have indicated a voicing contrast, since, if that had been the case, then series 3 would also have been represented by medial double writing, which is clearly not the case, both series 3 and 4 being represented by medial single writing. It should be noted here that Gamkrelidze (1968: 94) was the first to suggest that medial double writing of stops in Hittite was used as a means to indicate the presence of aspiration:

The aspirated stops were rendered in Hittite cuneiform by double writing of consonants, whereas single writing was used to represent plain stops.

Gamkrelidze devotes a later article (1982) to a detailed analysis of Hittite consonantism, noting specifically (1982: 78-79):

In light of these facts, Sturtevant's rule acquires a completely different significance: The graphic reduplication of plosives is used to denote not the simple voiceless plosives but the corresponding aspirated phonemes, while their single writing was used for non-aspirated consonants.

Thus we can reach the conclusion that the Hittite phonological system was characterized by two series of plosives: aspirated ones denoted by the graphic reduplication of the relevant consonant on the one hand, and non-aspirated ones on the other, denoted by single writing of the corresponding consonant.

Three series of Proto-Indo-European plosives: 1) glottalized, 2) voiced (aspirated), and 3) voiceless (aspirated) were reduced in the Hittite phonological system into two series opposed to each other by virtue of aspiration. The differentiating feature for the phonological opposition of plosives is only the factor of aspiration (tenseness), regardless of the original voiced/unvoiced opposition of the plosives, which had phonemic significance in the Proto-Indo-European system. The correlation of Proto-Indo-European plosives depending upon whether they were voiced, voiceless or glottalized was replaced in the Hittite phonological system by the correlation on the basis of “aspiration” (tenseness).

The feature of aspiration, which had been phonologically irrelevant with the phonemes of series 2) and 3) in Proto-Indo-European, became a phonologically significant feature in the Hittite system of plosives. In the process, the Proto-Indo-European series 1) and 2) merged into a general series of non-aspirated plosives as opposed to the series of aspirated ones, which derives from the Proto-Indo-European series 3) of voiceless (aspirated) plosives.

With the adoption of the Akkadian cuneiform writing, the two series of Hittite plosives — the simple and the aspirated — were written not by the signs for voiced and voiceless plosives, as these were not differentiated in the early Akkadian writing system, but with the single and double writing of the respective consonants. Accordingly, the *single* writing of a consonant was used to express *simple* plosives, while for the Hittite *aspirated* (tense) plosives a new means of denotation was found, that is the *reduplication* of the consonant in question, by which was solved the problem of how to differentiate graphically between simple plosive and the corresponding aspirated consonant.

This does not explain the whole picture, however, for we must still account for the exceptions to Sturtevant’s Law. Since the exceptions exhibit medial double writing of stops in Hittite words which correspond etymologically to words in other Indo-European languages with medial voiced stops (or their equivalents, these being derived from either earlier glottalized stops or earlier voiced aspirates at the Proto-Indo-European level), the distinguishing characteristic cannot have been aspiration. Let us take a look at each of the exceptions listed previously (the Proto-Indo-European reconstructions are transcribed according to Gamkrelidze and Ivanov’s system, with reference to the traditional reconstructions):

- A. Hittite *ú-uk-ga* “I”: in this case, we are dealing with a particle added to the stem (cf. Sturtevant 1951: 103, §170a), so that, in fact, we have gemination: Proto-Indo-European **ǵ₁ek’-* + **-k’e/o* (in traditional terms,

- * $\text{ḫ}_1\text{eḡ-}$ + *-ge/o) > Proto-Anatolian *ek+ka > Hittite (with analogical u) *uk+ka. The particle appears in Greek as -γε, dialectal -γα.
- B. Hittite 2 pl. medio-passive ending *-dduma* in, for example, *i-ya-at-du-ma* “you go”: here, the verb stem is probably to be reconstructed as * $\text{ḫ}_1\text{y-eḫ}_4$ - (so Sturtevant 1951: 34, §61; Puhvel 1984ff. 1/2: 334-335, however, considers *iya-* to be a thematic stem comparable to Vedic 3 sg. pres. *ayate* and derives it from earlier **eyo-*), to which the ending *-dum- (traditional *-dhum-) has been added. Most likely, the second laryngeal (* ḫ_4), which was lost as an independent phoneme in Hittite, has merged with the following dental, producing a geminate. Thus, double writing here indicates former presence of a laryngeal, which has left a trace in the gemination of the following stop.
- C. Hittite (3 sg. pres.) *píd-da-i*, *pád-da-i* “to dig”: here, we are dealing with a Proto-Indo-European stem *bed-/bod- (traditional *bhedh-/bhodh-), to which a laryngeal suffix has been added: *bed- + *-ḡ-. In this case, the laryngeal has merged with the preceding stop, producing a geminate.
- D. Hittite (acc.-dat. sg.) *am-mu-uk-ga* “to me” (also written *am-mu-uk*, *am-mu-ug-ga*, *am-mu-uq-qa*, *am-mu-uk-qa*): as in the first example, we are dealing with a particle that has been added to the stem, thus producing gemination.
- E. Hittite (nom. sg.) *me-ik-ki-iš* “large”: this is similar to the third example in that a laryngeal suffix has merged with a preceding stop, producing a geminate: Proto-Indo-European *mek'- (traditional *meg̃-) + *-ḡi- > Hittite *mekkis.

5. Conclusions

On the basis of the preceding analysis, Sturtevant's Law is to be reinterpreted as follows: double writing of medial stops indicates stop plus something additional, that is, either aspiration or gemination, while single writing of medial stops indicates a plain stop pure and simple.

According to Melchert (1994: 21), medial double writing of stops in Hittite indicates fortis (= long) articulation, while single writing indicates lenis (= short) articulation. Specifically, Melchert (1994: 117) notes:

I assume that the PA [= Proto-Anatolian] contrast of voiceless/voiced stops has been reanalyzed in Hittite as one of fortis/lenis, with the realization in medial position being that of long/short. I retain the standard symbols for voiceless and voiced stops for convenience. One important contributing factor in this reanalysis was the devoicing of voiced stops in word-initial position.

Melchert's views are not incompatible with the conclusions reached in this paper.

On fortis/lenis articulation, cf. Laver (1994: 344) and Ladefoged — Maddieson (1995: 95-99). Both Laver and Ladefoged — Maddieson caution against the careless use of these terms.

REFERENCES

- BOMHARD, Allan R. 1984. *Toward Proto-Nostratic: A New Approach to the Comparison of Proto-Indo-European and Proto-Afroasiatic*. Amsterdam.
- . 1986. "The Aspirated Stops of Proto-Indo-European". *Diachronica* III/1. 67-80.
- . 1988. "Recent Trends in the Reconstruction of the Proto-Indo-European Consonant System". *Historische Sprachforschung* 101. 2-25.
- . 1996. *Indo-European and the Nostratic Hypothesis*. Charleston, SC.
- BOMHARD, Allan R. and John C. KERNS. 1994. *The Nostratic Macrofamily: A Study in Distant Linguistic Relationship*. Berlin and New York, NY.
- BRUGMANN, Karl. 1904. *Kurze vergleichende Grammatik der indogermanischen Sprachen*. Reprinted 1970. Berlin.
- DIAKONOFF, I. M. and V. P. NEROZNAK. 1985. *Phrygian*. Delmar, NY.
- GAMKRELIDZE, Thomas V. 1968. "Hittite and the Laryngeal Theory". In: J. C. HEESTERMAN, G. H. SCHOKKER, V. I. SUBRAMONIAM (edd.), *Pratidānam: Indian, Iranian and Indo-European Studies Presented to Franciscus Bernardus Kuiper on his Sixtieth Birthday*, 89-97. The Hague.
- . 1976. "Linguistic Typology and Indo-European Reconstruction". In: Alphonse JUILLAND (ed.), *Linguistic Studies Offered to Joseph Greenberg*, vol. 2: 399-406. Saratoga.
- . 1982. "Problems of Consonantism of the Cuneiform Hittite Language". In: J. N. POSTGATE (ed.), *Societies and Languages of the Ancient Near East: Studies in Honour of I. M. Diakonoff*, 76-80. Warminster.
- JAKOBSON, Roman. 1971 [1957]. "Typological Studies and Their Contribution to Historical Comparative Linguistics". In: Roman JAKOBSON, *Selected Writings*, vol. I: 523-532. 2nd edition. The Hague.
- KRONASSER, Heinz. 1956. *Vergleichende Laut- und Formenlehre des Hethitischen*. Heidelberg.

- . 1966. *Etymologie der hethitischen Sprache*. Vol. 1. Wiesbaden.
- LADEFOGED, Peter, and Ian MADDIESON. 1995. *The Sounds of the World's Languages*. Oxford and Cambridge, MA.
- LAVER, John. 1994. *Principles of Phonetics*. Cambridge.
- MARTINET, André. 1970. *Économie des changements phonétiques*. 3rd edition. Bern.
- MELCHERT, H. Craig. 1994. *Anatolian Historical Phonology*. Amsterdam and Atlanta, GA.
- PUHVEL, Jaan. 1984- . *Hittite Etymological Dictionary*. The Hague.
- SHEVOROSHKIN, Vitaly. 1988. "Indo-European Consonantism in Anatolian". In: Y. L. ARBEITMAN (ed.), *A Linguistic Happening in Memory of Ben Schwartz: Studies in Anatolian, Italic, and Other Indo-European Languages*, 283-303. Louvain-la-Neuve.
- STURTEVANT, Edgar H. 1951. *A Comparative Grammar of the Hittite Language*. Vol. I. 2nd edition. New Haven.
- SZEMERÉNYI, Oswald J. L. 1996. *Introduction to Indo-European Linguistics*. Oxford.

[Reprinted from *The Asia Minor Connexion: Studies on the Pre-Greek Languages in Memory of Charles Carter*, ed. by Yoël L. Arbeitman. Louvain and Paris: Peeters [2000], pp. 35—46.]